TORSION CONTROL BOLT

Precision Auto Engineers

Technical Data Sheet

T.C.B bolts are a fastening system offering many advantages over conventional structural bolt systems. Lower costs for bolting installation and inspection can add up to tremendous savings when compared to conventional structural bolting systems.
Precision Auto Engineers is into manufacturing of fasteners since 1963. We are IS0 9001 and CE certified company.
All the manufacturing is done following the very stringent quality norms set with years of experience. This reflects in the quality of all the range of products, whether it is new or old.

T.C.B bolts are installed with a quiet, light weight electric installation tool which reduces operator fatigue and eliminates problems in compliance with OSHA Noise Regulations encountered when using pneumatic impact wrenches. Since the bolt is calibrated so the spline tip twists-off when the proper bolt tension is achieved, there is no need to rely on a calibrated wrench or on an operator's skill to correctly install the bolt to the proper tension. Torsion Contro Bolts feature a specially developed lubricant system which provides consistent assembly properties over a wide range of installation conditions. The correct fastener tension in compliance with AISC Bolting Specifications is achieved in the Assembly, because the bolt assembly is factory calibrated. Evidence of proper tension can be accomplished by visual inspection to see that the spline has twisted off, thus reducing the expense of more costly bolting inspections.

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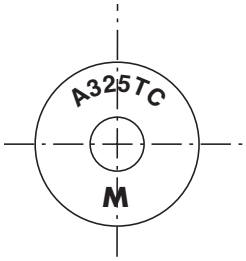
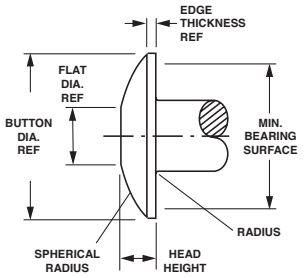
Assemblies are manufactured to ASTM F1852 (A325 equivalent) or ASTM F2280 (A490 equivalent) standards in India using domestically produced steel. Each Bolt is pre-assembled with an ASTM F436 Hardened Washer and a Heavy Hex Nut. The lots are fully traceable from raw material through to finished product. Each lot is fully tested by our NABL Accredited Laboratory and certified test reports are included with each shipment. The bolts are supplied as ASTM F1852 ("Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength") or ASTM F2280 ("Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 150 ksi Minimum Tensile Strength") with a dome (round head) or heavy hex head configuration. The mechanical properties, threads, and thread length are the same as for Heavy Hex Structural Bolts. The diagram and table (below) show the dimensions of the dome head configuration used by PAE. The heavy hex head configuration can be supplied by special order.

Dimensions for Bolts



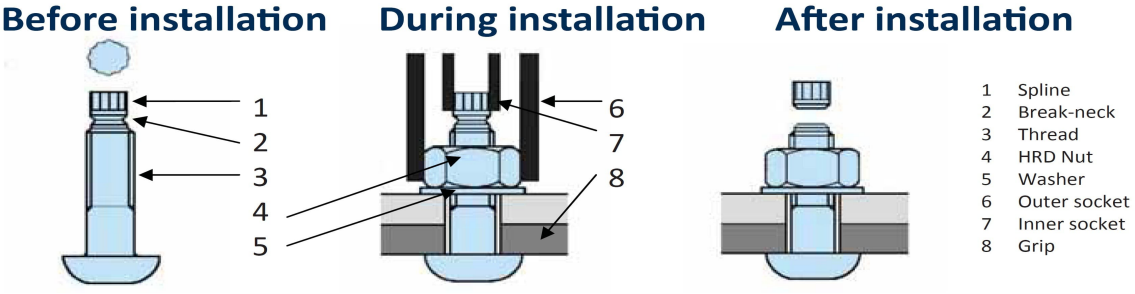


BOLT DIAMETER	HEAD HEIGHT	MINIMUM BEARING SURFACE DIAMETER
¾"	.455" / .483"	1.338"
7/8"	.531" / .563"	1.535"
1"	.591" / .627"	1.771"
1-1/8"	.658" / .718"	1.991"

The correct fastener tension, in compliance with AISC/RCSC Bolting Specifications (covered in the "Specification for Structural Joints Using ASTM A325 or A490 Bolts"), is assured by proper control of the dimensions (especially the groove diameter of the spline) and friction conditions.

Easy to Install

- Can be used anywhere a standard structural bolt is used (provided that it is acceptable to the responsible designer or project engineer).
- Does not depend on tool calibration or operator skill for proper assembly.



- Lightweight installation tool.
  - Electric Power Tool
  - Quiet installation system.
- Reduced operator fatigue.
  - Non-Impacting Electric Tool.
  - No external reaction moment (to twisting).
  - Easier to setup and move than air compressor and air lines.
- Shipped assembled (nut, bolt & washer) in sealed metal kegs. No field nutting required.
- Pre-assembled fasteners that ensure matched sets – saves assembly time.

Allows For Rapid Visual Inspection

- Eliminates operator error during assembly.
- Can visually inspect for proper installation by seeing that the spline has twisted off.
- No need for expensive installation tool calibration.

Reduced Cost of Installation

- Save money in installation.
  - Increased installation speed (typically 2 to 3 times more bolts installed per man-hour).
  - Lower inspection costs (quick visual check vs. typical rechecking of – 5% of all joints).
- Pre-assembled fasteners that ensure matched sets – saves assembly time.
- One man, one side assembly (no need for a back-up man).
- It can save money in shop fabrication by using bolted web stiffeners and gussets rather than welding. Successful bolt installation does not require highly skilled labor.

Typical Expected Cost Savings

The following information is an overview of typical savings that may be possible when using T.C.B instead of a standard A325 Bolt with a nut and washer.

INSTALLATION CONDITION	REGULAR A325 BOLT-NUT-WASHER	T.C.B Fastener
Purchase Fasteners	Buy Bolt, Nut, and Washers Separately. Come in separate containers. Maintain separate test reports, lot numbers and documentation.	Come in pre-assembled in 1 can. One source for test reports and documentation.
Pre-Testing	Test each combination of bolt-nut-washer in load cell. Maintain this combination in the field. Test daily for calibrated wrench tightening.	Run confirmation testing in load cell using standard electric wrench.
Equipment and Tools (enough to do the job)	Impact Wrenches (~35# each) and air compressors/air lines. Load Cell. Calibrated Torque Wrench.	Shear Wrenches (~15# each) and electric generator. Load Cell.
Pre-Tensioning	Each connection, starting from most rigid section.	Each connection, starting from most rigid section.
Installation	Typically ~24/40 bolts/man-hour.	Typically ~60/100 bolts/man-hour.
Inspection	Typically, could expect to recheck 5-10% of the bolts by manual torque wrench.	Visual inspection is normally all that is required.

The cost of the first three rows will vary by project. The cost of additional paperwork and maintenance of the individual containers can be expected to take up to ½ hour per lot of received material. Pre-testing is very quick and simple for T.C.B. If calibrated torque wrenches are used for installation, pre-testing must be done on a daily basis (resulting in several additional hours over the course of the project). Also, tool calibration is required for installation by torque.

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Pre-tensioning operations are the same for all high strength structural bolts. The snug tight condition is required for all connections prior to final tightening.
Final installation is typically two to three times faster with T.C.B.

Handling, Storage And Pre-Installation

Handling and Storage

The following information, from the AISC/RCSC "Specification for Structural Joints Using ASTM A325 or A490 Bolts", is applicable to all high strength fasteners, including T.C.B Bolts: "Fasteners shall be protected from dirt and moisture at the job site. Only as many fasteners as are anticipated to be installed and tightened during a work shift shall be taken from protected storage. Fasteners not used shall be returned to protected storage at the end of the shift. Fasteners shall not be cleaned of lubricant that is present in as-delivered condition." The last point is very important for T.C.B Bolts. The lubrication condition on the fasteners cannot be modified, that is, never clean, strip or add additional lubrication to the product. Opened cans should be stored indoors, protected from the elements, to prevent environmental contamination from rain, dirt, rust, etc...

Use of Washers

The ASTM F436 Washer included with the tension control assembly must be placed under the nut in all cases. Refer to section 6 of the RCSC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for additional requirements governing the use of additional washers.

Snug Tightening

All of the fasteners in the connection must be brought to a snug tight condition prior to final tightening. This method will prevent interactions between bolts as additional bolts are tightened.
As always, fasteners should be tightened in sequence from the most rigid section outward. In some cases, this may require more than a single cycle of systematic tightening or tightening in a pattern.

Pre-Installation Testing

Representative samples should be checked at the job site in a device capable of indicating bolt tension. The testing should demonstrate that the system develops the proper tension, prior to installation, in accordance with RCSC recommendations.

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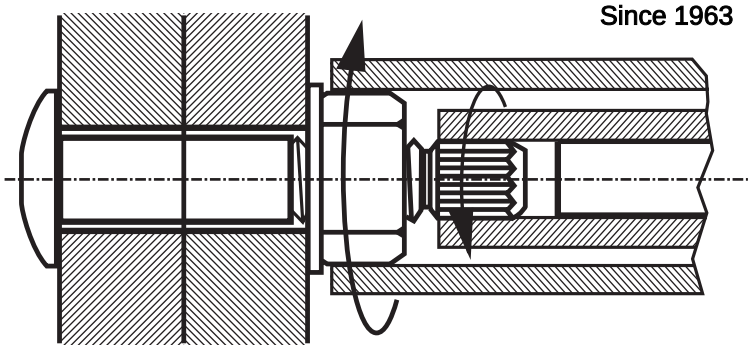
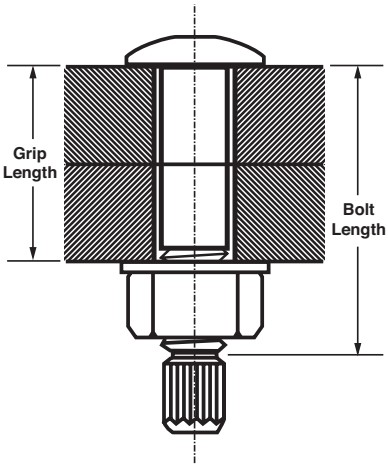
How Torsion Control Bolt System Works

These fasteners are designed to be installed with various types of lightweight portable electric wrenches specifically intended for use with this style of structural fasteners. They can be utilized for any applications where A325 or A490 – Type I or Type III (weathering steel) hex bolts are specified. The installation tool has an inner socket which engages the spline tip of the bolt, while the outer socket engages the nut. The outer socket rotates the nut relative to the bolt spline, and when the tension is sufficient in the fastener, the spline tip simply twists-off, leaving the tightened bolt correctly installed in the connection.



Determination of Bolt Length



BOLT DIA. (IN.)	TO DETERMINE BOLT LENGTH, ADD NOTED AMOUNT TO THE STEEL TO STEEL GRIP AND ROUND UP TO THE NEXT STD BOLT LENGTH. (IN.)
5/8	7/8
3/4	1
7/8	1/1/8
1	1 1/4
1 1/8	1 1/2

Grip Length is defined as the total thickness of all connected material, exclusive of washers. Each ASTM F436 washer used is 5/32 in. thick, use 5/16 in. for each beveled washer used.

Structural Fastener Tension

Fastener tension test requirements for slip-critical connections and connections subject to direct tension.

NOMINAL BOLT SIZE (IN.)	MINIMUM TENSION[1] IN 1000'S OF POUNDS (KIPS)	
	A325 BOLTS & F1852 ASSY	A490 BOLTS & F2280 ASSY
5/8	20.0	25.2
3/4	29.4	36.8
7/8	41.0	51.5
1	53.6	67.2
1 1/8	58.8	84.0

[1]Equal to 70 percent of specified minimum tensile strengths of bolts (as specified in ASTM Specifications for test of full size A325 and A490 bolts with UNC threads loaded in axial tension). May be rounded to nearest 1000 lbs. (chart includes additional 5% per AISC spec.)

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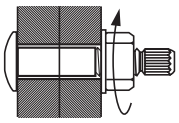
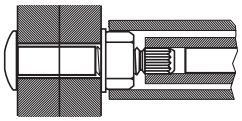
Installation Procedures

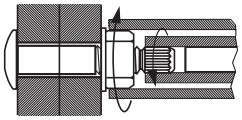
1. Nut and washer identification markings should face away from the connection. All fasteners in the connection should be snug tight.



2. Fit inner socket over the grooved spline and push the wrench slightly, then engage the outer socket over the nut.



3. Start the wrench. The outer socket rotates the nut relative to the bolt during tightening, and the bolt will be tightened until the required bolt tension is reached. At this point the splined tip shears off.



4. When the installation is complete, remove the socket from the nut and depress the ejection lever to discharge the sheared spline from the inner socket of the wrench.